3/4 B.Tech. FIFTH SEMESTER

ME5T2 METAL CUTTING & MACHINE TOOLS Credits: 4

Lecture:- 4 periods/week **Internal assessment: 30marks**
Tutorial : - **Semester end examination: 70 marks**

Objectives:

1. Provide the basic concepts in mechanics of metal cutting, chip formation, various tool materials and tool life.
2. Impart the concept of types of lathe, various operations that can be performed in various lathes, various mechanisms adopted.
3. Educate the basic fundamentals of reciprocating machine tools shaper, slotter and planning machines.
4. Instruct the working principle, operations performed, work holding devices and different attachments in drilling and milling machines.
5. Acquaint with the fundamentals of finishing process, super finishing process and their associated machine tools.

Learning outcomes:

At the end of course the students will be able to:

1. Gain knowledge on fundamentals of metal removal processes
2. Get knowledge of working principle, mechanism and various operations performed on lathe
3. Familiarize with shaper, planner and slotter functions, mechanisms and various operations
4. Get awareness of drilling and milling machines, various operations and nomenclature of cutters
5. Select a suitable finishing process for a specific application

Pre-Requisites:

Metallurgy & Material Science

UNIT – I

BASICS OF METAL CUTTING:

Elementary treatment of metal cutting theory – elements of cutting process – geometry of single point tool angles, chip formation and types of chips – built up edge and its effects chip breakers.

UNIT-II

MECHANICS OF METAL CUTTING:

Mechanics of orthogonal cutting –Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, tool materials, constructional features of speed gear box and feed gear box.

UNIT – III

LATHE:

Engine lathe – principle of working, specification of lathe – types of lathe – work holders tool holders – box tools taper turning, thread cutting – for lathes, accessories and attachments, lathe operations, turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout.

Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes – tool layout and cam design.

UNIT – IV

SHAPING MACHINES:

Types, Principles of working – principal parts – specifications, operations performed, work holding devices, machining time calculations.

UNIT – V

SLOTTING AND PLANING MACHINES:

Types, Principles of working – principal parts – specifications, operations performed, work holding devices, machining time calculations.

UNIT –VI

DRILLING & BORING MACHINES:

Principles of working, specifications, types, operations performed – tool holding devices, work holding devices – twist drill –reamers- Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

UNIT – VII

MILLING MACHINE:

Types, Principles of working – specifications – classification of Milling Machines – principal features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, geometry of milling cutters, work holding devices, cutter holding devices – methods of indexing, accessories to milling machines, gear cutting.

UNIT –VIII

GRINDING:

Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.

Learning recourses

Text book

1. Production Technology, (17th edition), by R.K. Jain, Khanna publishers, 2011.
2. Production Technology, by HMT, (Hindustan Machine Tools), TMH publications 2001.
3. Fundamentals of Metal cutting and Machine tools, (2nd edition) by B.L. Juneja, G.S.Sekhon and Nitin Seth, New age international publishers, 2005.

Reference books:

1. Metal cutting, (4th edition) by Edward Trent and Paul Wright, Butterworth-Heinemann,2000.
2. Metal cutting Principles, (3rd edition), by M.C. Shaw, , 3rd ed., Oxford, 1957.
3. Fundamentals of metal machining and machine tools, by Boothroyd, , Scripta Book Co., 1975.
4. Workshop Technology Vol II, (10th edition), by B.S.Raghu Vamshi, Dhanpat Rai &co(p) Ltd., 2009.
5. Manufacturing technology and Metal cutting tools Vol-II,(2nd edition) by P.N Rao ,TMH publications, 2000.